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[From 'THE AUK,' Vol. XXX, No. 1, January, 1913.]

CONTRIBUTIONS TO AVIAN PALEONTOLOGY.

BY R. W. SHUFELDT.

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## CONTRIBUTIONS TO AVIAN PALEONTOLOGY.

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### I. THE STATUS OF EXTINCT MELEAGRIDÆ.<sup>1</sup>

#### *Plate III.*

UP to the present time, there have been but three species of fossil *Meleagridæ* described and recorded, and these are correctly listed — in so far as their names go — on page 388 of the third edition of the A. O. U. Check-List of North American Birds. Two of these, namely *M. antiqua* and *M. celer*, were described by Marsh,— the former being from the Oligocene (White River) of Oregon [?], and the latter from the Pleistocene of New Jersey.

It may be of interest, but surely of no importance, that Marsh also described other fossil remains of a bird as *M. altus* from the "Post-pliocene" of New Jersey, which has since been discovered to be but a synonym of *Meleagris superba* of Cope.

*M. superba* is the third species listed in the A. O. U. Check-List, and is said to have come from the Pleistocene of New Jersey. On

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<sup>1</sup> *The Illustrated Outdoor World and Recreation* of New York City will soon publish in serial form a "History of the North American Turkeys" by E. A. McIlhenny, to appear as a book later on. The present article forms, in part, one of the chapters on Prehistoric Turkeys.

the 25th of April, 1912, Dr. George F. Eaton wrote me that the material, upon which *M. altus* is based, "is in the Peabody Museum (type) with other types of fossil *Meleagridæ*."

Cope's description of *M. superbus* occurs in the Trans. Amer. Phil. Soc. (N. S. xiv. Pt. 1, 1870, 239); it being a very careful and detailed piece of work, based on the material before him, which is said to have consisted of "a nearly perfect right tibia, an imperfect left one, a left femur with the condyles broken off, and a right coracoid bone, with the distal articular extremity imperfect." In my opinion, there would be ample here to establish a fossil species of bird, especially if placed in the hands of a good comparative avian osteologist. Personally, I have never seen the material upon which *M. superba* was established; but, judging from its character and its amount, I am strongly inclined to believe that Professor Cope had a fossil American Turkey before him,—at least the fossil remains of one.

Professor Marsh would never allow me to examine and compare the fossil bones which he described as those he suspected of belonging to extinct turkeys, and I never did so during his life-time. Several years after he had attempted to establish *M. altus* (now known to be only a synonym of *M. superba* Cope), I informed him that I was not prepared to accept his conclusions in the matter; and finally it came to pass that I published in a paper what I desired to set forth on the subject. This paper was entitled "On Fossil Bird-bones Obtained by Expeditions of the University of Pennsylvania from the Bone Caves of Tennessee" (American Naturalist, July, 1897, 645-650); and, in connection with other things said in it, I pointed out that among the bones found, many of them belonged to *M. g. sylvestris*.

Admitting the establishment of *Meleagris superba* of Cope, we have now to discuss the two other species. These are, as stated above, *Meleagris antiqua* (1871), and *Meleagris eeler* (1872), both recorded by Professor O. C. Marsh. In my above cited paper on the Tennessee fossil bird-bones, p. 648, I have commented on the validity of these species as follows: "Professor Marsh at different times has described three species of alleged extinct Turkeys, viz., *Meleagris antiquus*, *M. altus* and *M. eeler*; but I am very sceptical indeed in regard to the validity of the first-named,



FOSSIL MELEAGRIDAE.



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i. e., *Meleagris antiquus*; or, in other words, I doubt the propriety of basing a new species of fossil turkey upon "the distal end of a right humerus," as Professor Marsh has done in this case. Nor do the characters he describes for this species, as being diagnostic, hold true. It is a positive detriment to science, in my estimation, to create new species of fossil birds upon the distal ends of long bones; and surely no assistance whatever to those who honestly endeavor to gain some idea of the avian species that really existed during prehistoric times. So far as *M. altus* and *M. eeler* are concerned, I can only say that I know nothing of them from personal examination of the material upon which the species are based, and this has been refused me."

"In the case of *Meleagris altus*, Professor Marsh says that the length of the tarso-metatarsal is equal to 176.5 mm. (p. 261), and the present writer says that it is by no means uncommon to find the same bones in adult specimens of *M. gallopavo* fully of that length, if not longer. The other characters Professor Marsh enumerates, may each and all be due to sexual and individual variations."

"In the case of *Meleagris eeler*, this likewise holds true; and in regard to the statement that the "remains preserved indicate a bird about half the bulk of *M. altus*," may be said with equal truth of *M. gallopavo*, in which species a similar discrepancy in size also exists between sexes and between the old and young."

"In other words, I am of the opinion, so far as I am able to judge from his descriptions, that when Professor Marsh described his three extinct and new species of *Meleagris*, he had nothing more or less before him than the very meagre and fragmentary remains of *M. gallopavo*."<sup>1</sup> As pointed out below, these birds may not have been true turkeys at all.

It is clear, from Professor Marsh's description, that he attempted to establish *Meleagris antiqua* upon an *imperfect* distal extremity of a right humerus, and *M. eeler* upon the fossil bones enumerated below. It has already been pointed out in a previous paragraph that I found not a few fossil bones of *Meleagris g. silvestris* in the material which was taken from the Bone Caves of Tennessee,

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<sup>1</sup> *The American Journal of Science*, ser. 3, ii, 1871, 126. (*Meleagris antiqua*.) The title is on page 120.

while no such bones occurred in the great mass of fossil bird bones from the Oregon desert.<sup>1</sup>

Believing that things might have changed a little since the time Professor Marsh declined to allow me to examine the fragments of fossil bones upon which he had attempted to establish three extinct species of *Meleagris*,— a matter of some fifteen years ago,— I wrote a letter to Dr. George F. Eaton (April 19, 1912) of the Yale University Museum. This brought a reply next day, and in this he kindly stated that he would bring my request before Professor Charles Schuchert, curator of the Geological Department of the Peabody Museum of Natural History of Yale University. With great promptness and marked courtesy, Professor Schuchert (May 2, 1912) sent me, by registered mail, Marsh's *type specimens*, which he had used in his descriptions of *Meleagris antiqua* and *M. celer*. On the third of May, 1912, this material came safe to hand, and I immediately made a complete set of photographic negatives of the specimens.

I desire to express my thanks for the courtesies and privileges extended to me in this matter by Dr. Eaton, Professor Schuchert of Yale University; Drs. James E. Benedict and Charles W. Richmond of the U. S. National Museum, and Mr. Newton P. Scudder, Librarian of the same institution. Through their aid, I was enabled to examine and compare, with Marsh's fossils before me, a mounted skeleton of a wild turkey (*M. g. silvestris*), taken many years ago by Professor Spencer F. Baird at Carlisle, Pennsylvania, and to consult all the existing literature on the subject. Upon examining the material forwarded me by Professor Schuchert after it came into my hands, I found first, in a small tube closed with a cork, the distal end of the right humerus of some large bird. The cork was marked on the side "Type"; on top "*Mel. antiquus*. G. Ranch. Col. G. B. G. Aug. 6th, 1870." The specimen is pure white, thoroughly fossilized, and imperfect. The second of the two specimens

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<sup>1</sup> Shufeldt, R. W. 'A Study of the Fossil Avifauna of the Eocene Beds of the Oregon Desert.' Journ. Acad. Nat. Sci. Phila., ser. 2. IX. 1892, pp. 389-425, Pls. XV-XVII. Advance abstracts of this memoir were published in 'The Auk' (Vol. VIII, No. 4. Oct. 1891, pp. 365-368). The American Naturalist (Vol. XXV, No. 292, Apr. 1891, pp. 303-306, and *Ibid.*) No. 297, Sept. 1891, pp. 818-821) and elsewhere. Although no turkeys were discovered among these fossils, there were bones present of extinct grouse.

received is in a small pasteboard box, marked on top "*Birds. Meleagris, sp. nov. N. J. Meleagrops celer* (type)." The specimen is the imperfect, proximal moiety of the left tarso-metatarsus of a rather large bird. It is thoroughly fossilized, earth-brown in color, with the free borders of the proximal end considerably worn off. On its postero-external aspect, written in ink, are the words "*M. celer*." On the cork of the vial containing the end of the humerus, the initials G. B. G. are, without doubt, those of Dr. George Bird Grinnell; and, as he there states that the specimen was collected at G. Ranch, Colorado, it is clear that the locality given (Oregon) in the last edition of the A. O. U. Check-List is incorrect. Besides, Marsh states in his article that the fossil was from Colorado; and this is further evidenced in the fact that the fragment is *pure white*, which is so characteristic of such fossils found in the White River region of Colorado.

My comparisons of Marsh's specimens of his alleged fossil turkeys with the corresponding bones of the skeleton in the case of *Meleagris gallopavo silvestris*, were most critical and thorough. Everything to make such comparisons complete were at my disposal for several hours, and no pains were spared to do the subject justice.

Marsh, in his article, evidently attached but little or no importance to the "other fragments" which were found with those upon which he based his descriptions; and from this fact it is fair to presume that they must, indeed, have been very fragmentary.

It has been unfortunate for science that Professor Marsh in his life-time was enabled to pay such scant attention to the osteology of existing birds; his weakness in this particular is evidenced in not a few places throughout his writings, as I have elsewhere pointed out.<sup>1</sup>

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<sup>1</sup> Marsh, O. C. *Odontornithes*. "The Struthious characters, seen in *Hesperornis*, should probably be regarded as evidence of real affinity, and in this case *Hesperornis* would be essentially a carnivorous, swimming Ostrich." (!)

Shufeldt, R. W. *On the Affinities of Hesperornis*. *Nature*, Vol. 43, No. 1104, London, December 25, 1890, p. 176. Review of Professor D'Arcy Thompson's paper, showing the true affinities of *Hesperornis* with the *Colymbidæ*, and not with the Ostriches. See also Shufeldt's "Comparative Osteological Notes on the Extinct Bird *Ichthyornis*" (*Jour. Anat. and Phys.*, Vol. XXVII., N. S., Vol. VII. Part III. Art. 2. Lond. Apr. 1893, pp. 336-342) where it is shown that Marsh entirely overlooked the relationships existing between *Ichthyornis* and *Rhynchops*, and for the reason that he was not familiar with the skeleton in the latter existing genus of birds.

In the case, then, of *Meleagris antiqua* of Marsh, I am of the opinion that we have not sufficient evidence before us to establish the fact that any such bird ever existed in prehistoric time; my reasons for so believing are the following:—

1. The existing material upon which the species is based is altogether too fragmentary to pronounce with anything like certainty that it ever belonged to a *Meleagris*.
2. The material is not only fragmentary, but very imperfect (see Plate III, Figs. 1 and 2).
3. The fragment does not present the "Characteristic portions" of that end of the humerus in a turkey as Professor Marsh states that it does. In any event, an imperfect distal fragment of the humerus of any big, gallinaeous bird is a very unsafe *bit* to establish a new species upon, and especially a supposed-to-be extinct one.
4. It is open to serious question whether the genus *Meleagris*, as the genus *Meleagris*, existed at all at the time the "Miocene clay deposits of Northern Colorado" were deposited.

In no way do I question that this fragment *may have* belonged to the skeleton of some long ago extinct galline fowl, about the size of an adult existing turkey; but that it was a true *Meleagris*, I very much doubt. It is just as likely to have belonged to many another kind of gallinaeous species, or even to some entirely different kind of bird in no special way related to the turkey.

Coming next to the material representing *Meleagris celer* of Marsh, as described above and here figured in my Plate (Figs. 3-5), a still greater uncertainty attaches to the supposition that it belonged to the skeleton of an extinct species of *Meleagris*.

As above pointed out, this is likewise an imperfect, much worn fragment of the proximal half of a tarso-metatarsus. I am not taking the tibiae mentioned by Marsh into consideration, for of them he says himself that they only "probably belonged to the same individual" (see *antea*). There is no uncertainty about it at all.

Upon comparing this proximal moiety of a tarso-metatarsus of an alleged extinct species of turkey — *Meleagris celer* of Marsh — with the corresponding part of that bone in the skeleton of an adult

*Meleagris g. silvestris*, it is to be discovered at once that the comparable characters by no means agree.

In the existing species of turkey, there is but a single median groove marking the hypotarsus posteriorly. In Marsh's *M. celer*, the hypotarsus of this tarso-metatarsus is thus *twice* longitudinally grooved.

In *M. g. silvestris*, there is a pronounced ridge of bone extending some distance down the shaft, it being the continuation of the thickened, inner border of the hypotarsus. In the case of the fossil fragment here being considered, this ridge is only *indicated*, and, if it were ever present at all, it is here broken off and missing. It is a dangerous practice to describe parts and characters in fossil bones that are not present there.

Again, in the case of this fossil fragment, its general appearance or *facies* is quite unlike the corresponding part of the tarso-metatarsus in *M. g. silvestris*, or that of any other existing wild turkey. Indeed, off-hand I would say that it never came from the skeleton of any meleagrine fowl at all,—existing or extinct. And, as in the case of the alleged *M. antiqua*, it may have belonged to the skeleton of the tarsus of some other kind of a galline fowl—not a meleagrine one—while it is quite as likely to have belonged to the skeleton of some heron (*Ardea*) or other large wader as it did to a turkey.

For example, in some of the herons “the hypotarsus of the tarso-metatarsus is 3-crested, graduated in size, the outer being the smaller; the tendinal grooves pass between them.”<sup>1</sup>

It has just been pointed out in the last paragraph that the hypotarsus of the tarso-metatarsus in Marsh's *Meleagris celer* is 3-crested, and the tendinal grooves pass between these crests, as in certain Herons. Mind you, I am not saying that Marsh had the bone of an extinct heron before him; but this is a significant fact, especially when we find, in the case of *M. g. silvestris*, the hypotarsus of the tarso-metatarsus is but 2-crested, having the median groove passing between them.

From fossil material to positively establish an extinct species of *Meleagris*, one should have at least a sufficient part of the

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<sup>1</sup> Shufeldt, R. W. Osteological Studies of the Subfamily Ardeinae. Journ. Comp. Med. and Surg. Vol. X, No. 4, Phila., Oct. 1899, pp. 287-317.

*sternum*, to pass with certainty on the missing portions; one or two of the long bones complete — or very nearly so — and, if possible, a few skulls and pelvic fragments. Lacking the last, a more or less complete coracoid and scapula are great aids in the matter of establishment. A complete *furcula* is of the utmost importance in a great many birds, and to this the gallinaceous ones are by no means exceptions. But, as in the case of *Meleagris antiqua* for example, Marsh had no such material before him; only the imperfect, fragmentary distal end of a humerus, that was all!

When Professor Cope was good enough to turn over to me several hundred fossil bones of birds for description,—had I made *new species* of all that I *might have done*, there would have loomed up in the list of fossil birds in the A. O. U. Check-List quite an extensive and varied fauna of extinct species and the higher groups; but I passed such fragmentary evidence by, and recommended that it be allowed to stand until some more material came from the same horizon and locality.

This is what should be done in the case of the *two imperfect, fragmentary bits* that Marsh had, and upon which he proposed to establish two extinct species of *Meleagris*.

### PLATE III.

Fig. 1. Anconal aspect of the distal extremity of the right humerus of "*Meleagris antiquus*" of Marsh.

Fig. 2. Palmar aspect of the same specimen as shown in Fig. 1.

Fig. 3. Anterior aspect of the proximal moiety of a tarso-metatarsus of *Meleagris celer* of Marsh.

Fig. 4. Posterior aspect of the same fragment of bone shown in Fig. 3.

Fig. 5. Outer aspect of the same fragment of bone shown in figures 3 and 4. All figures natural size. Reproduced from photographs made direct from the specimens by Dr. R. W. Shufeldt.

## II. STUDIES OF THE FOSSIL BIRDS OF THE OREGON DESERT.

Some twenty years or more ago, Professor E. D. Cope of Philadelphia placed in my charge for description a large collection of fossil vertebrates, that had been collected by himself and his assistants at Fossil and Silver Lakes in the Oregon Desert. To this collection were added numerous other fossils of a similar description,

which had been collected in the same region by Professor Thomas Condon of the University of Oregon, he being the first naturalist who discovered and collected any of the remains of fossil birds in that interesting locality. Professor Cope's chief assistant at the time was Mr. C. H. Sternberg, now known as one of the veteran fossil collectors of this country.

Ex-Governor Whitaker of Oregon was also an early collector of fossil birds at Fossil and Silver Lakes, and it was he who first discovered the remains of the now extinct swan, named by Cope *Olor paloregonus*.

This remarkable collection, as it came into my hands, consisted principally of the fossil bones of birds, as Cope had already described and published the mammals, fish and other forms.

To the birds, then, I gave especial attention, working the material up in great detail and with all possible care. Later on, the results of my labors were published as a quarto in the Journal of the Academy of Natural Sciences of Philadelphia,<sup>1</sup>—a paper which presents what we knew of that region at the time the memoir appeared, together with very full descriptions of all the genera and species of birds I found in the material, of existing as well as extinct forms.

These have, long ago, passed into the literature of the subject, and are more or less known to palæontologists everywhere. Most of this work was done early in the year 1891, at a time when but comparatively few skeletons of existing birds were available, and consequently many of the fossil species remained over,—either not referred to the species they represented, or described as species now extinct.

Nevertheless, some very interesting forms were brought to light, and the character of the ancient avifauna more or less clearly defined. When the collection came into my possession, Professor Cope had already published an account of some of the fossils of birds he had found in it; for example, among the Grebes he was enabled to make out from the numerous fossils such species as *Æchmophorus occidentalis*, *Colymbus n. californicus*, and *Podilymbus podiceps*. He had also described an extinct Cormorant, *Phalacrocorax macropus*, and an extinct Swan and Goose, but had done little else with the collection.

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<sup>1</sup> Vol. IX, Pls. XV–XVII, Phila., Oct. 1892.

As will be noted in my Philadelphia Academy memoir, to these I added a Pelican; nine Gulls and Terns, two of the former being new and now extinct; a Phalarope; two Coots, one of which was new and extinct; five Grouse, including a new and extinct genus and two new and extinct species; a large number of Ducks, Geese and Swans; a new and extinct Flamingo; also a Heron; two extinct Eagles; an Owl, and, finally, two new and extinct passerine birds. It is not my intention to refer to any of these here, beyond what has already been said,— the object of the present paper being to set forth the facts that during the summer of 1912 the entire aforesaid collection, with added material from the same localities, likewise a small collection from the U. S. National Museum — also from the Silver and Fossil Lakes region — again came before me for examination. The entire Cope collection now belongs to the American Museum of Natural History of New York City, and it was through the authorities of that institution that I was permitted to review these valuable fossils, and to prepare them for cataloguing. Upon undertaking this, by no means easy task, I found that the collection of bird skeletons at the U. S. National Museum, of existing species of American birds in particular, had been very much increased since the Cope collection first came before me. As a result, far more extensive comparisons could be made, and, naturally, new species and a number of previously unrecognized species came to light.

The enumeration of these will sufficiently account for publishing this brief advance abstract; while the reader, at the same time, is assured that the now completed memoir, covering the entire subject and presenting complete descriptions of all the new discoveries, will appear later under other auspices.

This abstract will list only such additional birds as I have been enabled to add to our lists of fossil forms through the above noted revision.

Among the *Pygopodes* I find two new species of Grebes, both now extinct, and neither apparently very abundant during Pleistocene time,— the first being a Grebe smaller than Holboell's but larger than our existing smaller Grebes; while the other was a Dabchick bigger than the present existing one in our fauna.

I find numerous bones of *Centrocerus urophasianus*, in no way

differing from the corresponding ones as they occur in the skeletons of the species of the present day.

Among the *Anseres*, I have to announce the discovery of *Mergus serrator* and other fossil bones, which appear to have belonged to specimens of *Mergus americanus*; also an undetermined form.

Among the Ducks, I find fossil bones — more or fewer of them — representing, for the first time, *Marila americana* (?) *M. valisineria*; *M. marila* (?); *M. affinis* (?); and *M. collaris* (?). Some of the material belongs to fossil examples of *Charitonetta albcola*, *Histrionicus histrionicus*, *Polysticta stelleri* and *Erismatura jamaicensis*. This last duck had already been found by Mr. L. H. Miller of San Francisco, and published by him in the Proceedings of the California Academy of Sciences.

Some of the bones point almost with certainty to the presence of *Branta c. hutchinsi*, *Branta c. minima*, and with absolute certainty to *Branta bernicla*.

Among the Swans, I find fossil remains of *Olor columbianus*, *Olor buccinator*, and a very large species of a new and now extinct Swan.

Further, I find fossil remains of *Botaurus lentiginosus* and *Ardea herodias*; and those of another heron I have to still consider. It is, however, a true *Ardea* and probably an extinct one.

Finally, I have to make the interesting announcement of having found fossil bones of two species of Eagles, both of which still occur in our existing avifauna; these are *Aquila chrysaëtos* and *Haliaëtus leucocephalus*.

